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Classification of fault systems and characteristics in Xujiaweizi depression

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Abstract: *Xujiawezi depression experienced three evolution stages, which includes Huoshiling Formation, Shahezi Formation, Yingcheng Formation, during the fault depression period ,mainly developed five strike direction fault systems. Based on the fault systems directions characteristics, we can determine that the NNW trending Xuzhong-Xudong fault are the main strike-slip fault, the NNW, approximately SN, NW, NE and EW trending faults are the strike-slip associated secondary faults. The main strike slip fault styles, the relationships among associated structures are conformed to dextral shear deformation pattern.*
Keywords: *Xujiaweizi depression, fault systems, fault characteristics, strike-slip*

I. Introduction

Xujiawezi depression experienced three evolution stages, which includes Huoshiling Formation, Shahezi Formation, Yingcheng Formation[1], the deformation of different evolution stages are superimposed to form the today's five groups trending faults, among the five fault systems, the south part of Xuxi fault and the north part are composed by different trending faults.The recent study shows that the different strike fault belong to different fault systems[2]. So the plane and vertical profile combination style are different[3]. Besides, for different faults the difference of deformation phases , deformation mechanism can make huge influence to the the deep natural gas hydrocarbon generation and accumulation .

II. The Fault Geometry Characteristics

Fault geometry characteristics analysis is the basic work to further resolve fault system, the faults geometry characteristics can not only reflect the fault formation time, but also can reveal the formation mechanism of faults. In the Xujiawezi depression, the faults has multidimensional directions strike characteristics, it developments at least five striking faults, namely NNW, approximately SN, NW, NE and EW trending faults(Fig 1). From the plane distribution characteristics of the fault, we can find that the NNW-striking faults are widely developed, the typical examples are large Xuzhong faults and the Xudong faults zones, besides, the Xuxi fault also developed several NNW-striking fault segments. The fault size in other direction are relatively small, scattered distributed. The Xuxi fault consists of south and north branch, mainly compounded by NNW , near SN, NW and NE-striking faults. It also reflects the complexity of the deformation, the directional faults across the deformation area are distributed surrounding the NNW-striking faults.

III. Fault Systems Division And Characteristics

According to the azimuth distribution characteristics of the five groups of faults, the Xu Zhon-Xudong strike-slip deformation are the main strike-slip fault zones, other striking faults and the Xuxi fault that composited by other multidimensional direction faults are secondary associated elements, they all conform to the NNW right-lateral strike-slip deformation model. Thus, the regional fault patterns are commonly interpreted as strike-slip dominated throughout the area(Fig 2).After dematcating the azimuth of different striking faults, we can get that the NNW-striking Xuzhong fault has the charactertics of left-step en-echelon and Xuzhong fault appears near SN-striking fault segments all indicated that they have the left-step en-echelon segmented growth feature in right-lateral shear deformation[4]. From the slip-distance curve of Xuxi fault, we can see that different striking faults connect to link gradually.

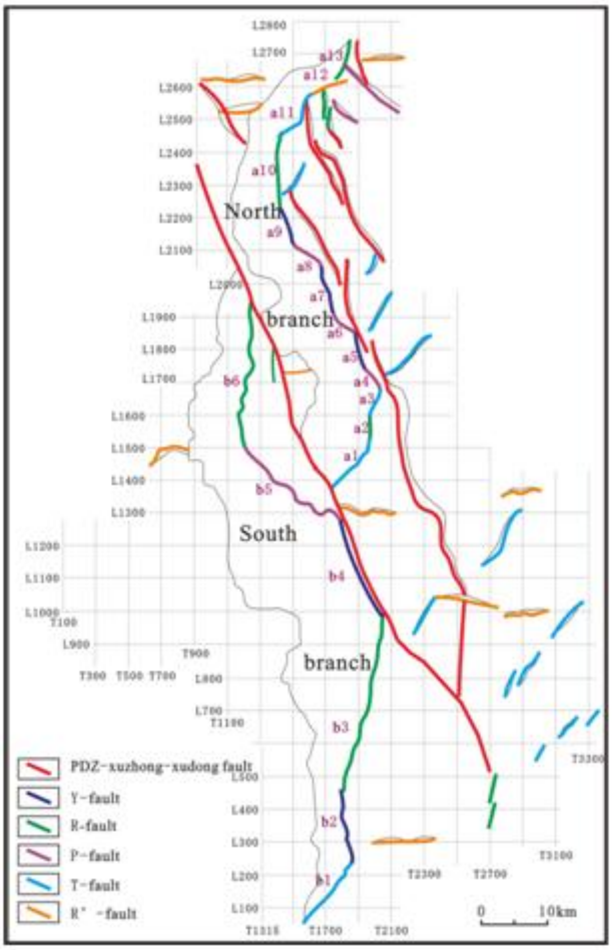

Fig 1. The outline map of main faults distribution in Xujiaweizi depression

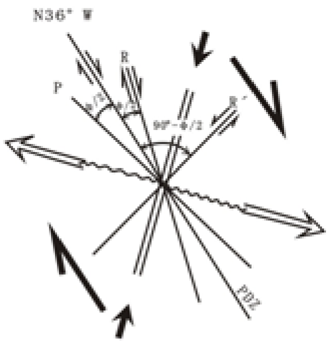

Fig 2. Riedel model of dextral simple shear

Thus, Xujiaweizi depression develop six fault systems, but different set of fault has different geometry characteristics, the combination pattern is also different, it reflect the difference of deformation(Fig 3).

Xuzhong fault (PDZ) : The fault plane is relatively flat, fault bend feature is not obvious. The "negative flower" feature in the profile and the "ribbon effect" showed that they have strike-slip deformation characteristics, it also shows that different period of strike-slip gradually connected to the growth characteristics. Xudong fault (PDZ) : The fault planes discontinuous distribution and the fault zone consists of left-step en-echelon faults. Among the fault zone also developed the near SN striking releasing bend linkage pattern fauls. In the profile, they show “negative flower” feature, part of the faults are reverse faults, these characteristics all indicate strike-slip deformation. Compare with Xuzhong fault, it shows relatively low grade deformation and distinct en-echelon overlap property,

The Y shear fault segments of Xuxi fault: It parallel to NNW-striking Xuxi fault segment, the fault plane is relatively flat. In the profiles, it developed some associated secondary fracture, namely the associated Y shear fracture of Xuzhong - Xudong main strike-slip faults.

The R shear fault segments of Xuxi fault: The fault striking is nearly NS direction. The "zigzag"shape in plane suggests that it is formed by linking of more secondary R and P, the geometry reflects dextral transtensional deformation mechanism[5]. In addition, it develops some synthetic accommodation faults formed the "listric fan" configurationthe in section.

The P shear fault segments of Xuxi fault: The fault striking is nearly NS direction. It also has the "zigzag"shape characteristics in plane and develops some synthetic accommodation faults formed the "listric fan" configurationthe in section. They reveal the dextral transtensional deformation characteristics.

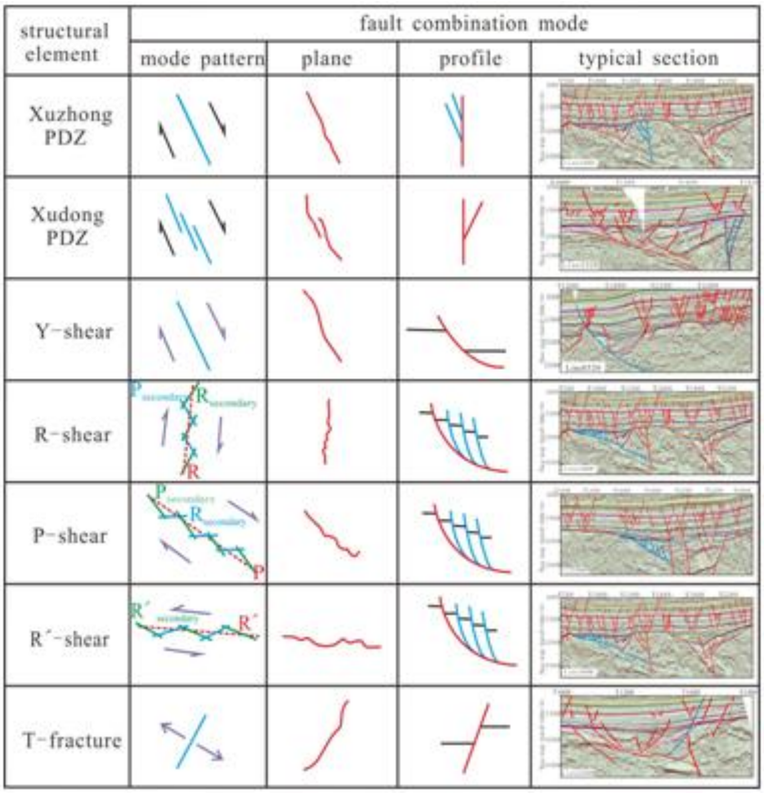

Fig 3 strike-slip fault combination mode in Xujiaweizi depression

The NE-striking T shear fault segments: It concludes the north of the north branch of Xuxi faults, the south of the south branch of Xuxi fault and the small size NE striking faults in the slope areas. These fault planes are straight and shows listric pattern in profile.From the the internal filling formation, we can see visible reverse drag rolling anticline from the seismic wave group characteristics, it reflects the extendional deformation characteristics.

Nearly EW-striking R 'shear fault segments: These faults mainly developed in the Xuxi fault segment points and the slope areas. The main characteristic is very few and small scale. The formation mechanism of this kind of faults are two ways: on the one hand is associated secondary fault by strike-slip deformation; on the other hand is developed by the local stress field changes to accommodate the deformation. It also has the "zigzag"shape characteristics in plane and develops some synthetic accommodation faults formed the "listric fan" configurationthe in section.

IV. Conclusion

Xujiaweizi depression is developed on the deformation of Xu Zhong fautl and xudong faults. The five-striking associated faults together with the main strike-slip fault zone constitute the tectonic framework in fault depression period of Xujiaweizi depression. The growth of Xuxi fault mainly depend on connecting of different striking associatd strike-slip faults. The regional fault patterns are commonly interpreted as strike-slip dominated throughout the area.

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